



Connected and Automated Vehicles Public Survey Report

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Background

The CAV-X Office at MnDOT concluded a series of in-person public meetings to gather input from members of the public, technical experts and other stakeholders to help guide future policy and recommended changes to laws, rules and policies related to connected and automated vehicles. A complete list of the sessions and insight gained from these meetings is found in the *Connected and Automated Vehicles Executive Report* and *Connected and Automated Vehicles Stakeholder Engagement Report*.

The goal of this effort was to make sure no stone remained unturned and that all Minnesotans had an opportunity to participate in this early stage of soliciting public feedback.

An online survey was developed as a way to allow people who were unable to attend or not interested in attending an in-person session an opportunity to share insights, questions or concerns. Individuals invited to participate in the in-person sessions by email were provided a link to the online survey. In addition, this link was made available to others through a variety of other emails and outlets (e.g., subcommittee meetings, the Minnesota State Fair, conferences, presentations, on the MnDOT website, etc.).

The online survey was fully completed by 103 participants with an additional 104 participants who partially filled out the survey. Their comments are summarized in this report.¹

This report includes all the verbatim comments within the report and/or in the appendix, so the MnDOT CAV-X team can review the detail to ensure that all ideas and concerns are heard.

Introduction to Survey

CAVs will promote sprawl by promoting more trips and longer trips.

Currently, our schools are not graduating enough engineers to meet the needs of companies.

Funding for transportation is already an issue, and much of CAV technology requires infrastructure.

If it's easier and faster, people will sprawl until their commutes again feel like the same effort.

Land use that is more sprawling than currently is my biggest concern due to the environmental impact.

Need to replace gas tax and registration fees with a Mileage Based User Fee.

Parking CAVs like personal vehicles doesn't reduce road use/congestion.

¹ This sample is comprised of individuals who may have heightened interest or knowledge of CAV. This survey provided an opportunity to express thoughts, questions or concerns and was not designed to “estimate” perceptions generalizable to the population as a whole.

The ability of customers to get economical off-peak rates and charging capabilities.

Who will be responsible for insuring the vehicle? Roadside units & other infrastructure is expensive.

Worried about sprawl, increased VMT, loss of public transit funding.

Connected and Automated Vehicles (referred to as CAV)



CAV has the ability to transform modern transportation and subsequently how we work and live. It's about more than vehicles; it's about the future of mobility.

MnDOT is engaging with stakeholders and the general public in a variety of ways to get feedback on a range of issues as Minnesota prepares for this emerging technology.

The survey opened with a brief introduction of connected and automated vehicles, addressing the potential to change transportation and mobility options. The survey also provided a brief explanation of connected vehicles and automated vehicles and noted some of the potential benefits of the technology.

What is CAV (Connected & Automated vehicles)?

- **Connected vehicles** communicate with roads, traffic signals, and other vehicles electronically.
- **Automated vehicles** take control of some or all driving tasks. This includes cruise control and parking and lane assist functions in some newer vehicles and much more.

CAV has the ability to transform modern transportation and subsequently how we work and live.



What are the potential Benefits of CAV?

- **Fewer collisions** since over 90% of collisions are caused by human error
- **Increased road safety** with fewer impaired and distracted drivers
- **Increased mobility** and **expanded accessibility** for persons with disabilities, elderly, and youth
- **Reduced costs of travel time** and **less congestion** since vehicle occupants could spend travel time engaged in other activities
- **Increased fuel efficiency** which would result in **environmental benefits** due to a reduction in emissions
- **Increased lane capacity** with truck platooning technology, adaptive cruise control, and real-time route optimization



The survey defined connected vehicles as vehicles that communicate with roads, traffic signals and other vehicles electronically. Automated vehicles were defined as vehicles that take control of some or all driving tasks, including cruise control, parking and lane assist and much more. The following benefits were identified for the respondents:

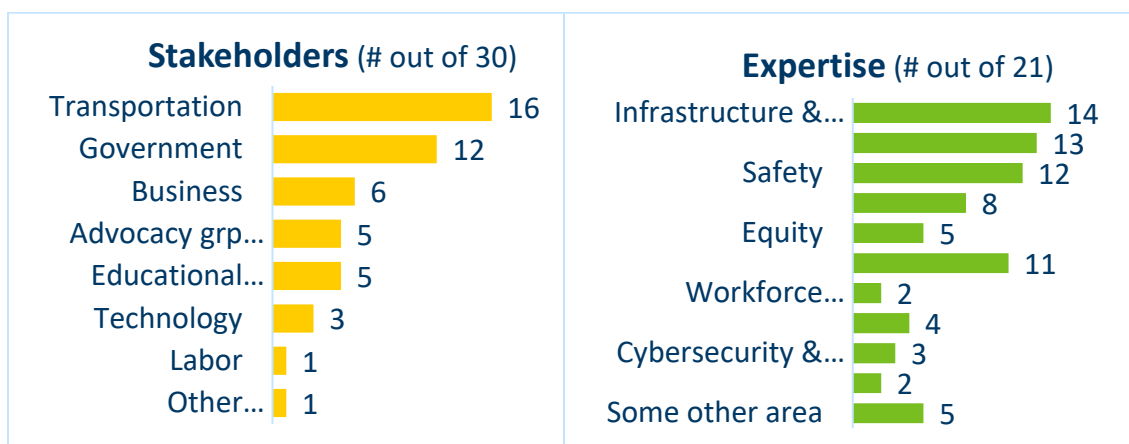
- Fewer collisions
- Increased road safety
- Increased mobility
- Expanded accessibility
- Reduced costs of travel time
- Less congestion
- Increased fuel efficiency
- Environmental benefits
- Increased lane capacity

Relationship with CAV

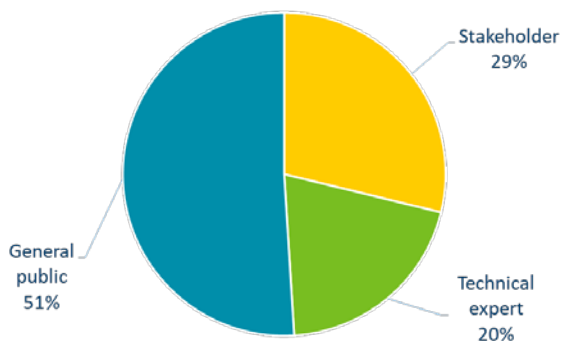
The survey was divided up into three sectors: the general public, stakeholders, and technical experts.

- General public (e.g., resident, person with interest in the topic, etc.)
- Stakeholder (e.g., vested interest due to role in a business, institution, organization or industry that will likely be impacted by CAV)
- Technical expert (e.g., experience/knowledge relevant to one or more aspects of understanding the impact of and successfully implementing CAV)

Half of the respondents classified themselves as members of the general public and the rest were split between stakeholders and technical experts.



How would you classify your primary relationship to CAV in MN (n=103)



Highlights

Safety benefits

There was a range of familiarity with CAV within this survey sample. The general public group was not overly familiar, the technical experts were quite familiar and the stakeholders fell somewhere in between. Regardless of the level of familiarity, there were a lot of common themes across the groups.

There is a lot of enthusiasm for CAV within this base of respondents, regardless of whether the respondent was a member of the general public, technical expert or stakeholder:

- Many see the potential for increased safety with the reduction in human involvement and error
- Many understand that more people could potentially get around with ease and realize increased independence, if they do not have to drive themselves
- And, for some it could be a life changer
- Several feel traffic would flow more efficiently, which would lead to other positives:
 - Saving money and time (and a reduction in stress)
 - Environmental benefits

A handful of respondents think it should also free up land for better use and could put Minnesota at the forefront of innovation.

Hesitant to accept without caution

While many saw the benefits of CAV, other respondents would only accept CAV with caution. The majority of respondents had at least one question or concern

- The underlying factors are about “how” CAV is designed, structured, tested, monitored and regulated and how widely it can be accessed (and if it’s ready to be rolled out)
- The “how” will impact whether or not the potential benefits become concerns or even negatives:
 - CAV could increase safety issues, if it doesn’t work well with traditional cars, pedestrians, bicyclist and those using mobility devices on the same streets
 - CAV could increase congestion if it motivates people to own their own CAV vehicles and/or take more solo trips
 - CAV could make fewer people feel the need to walk or ride a bicycle or use mass transit
 - CAV could result in inequities if it doesn’t work in all conditions or locations or for all demographic groups (and it limits funding for other forms of transportation)
 - CAV could have a negative impact on the environment if it leads to more energy use
 - Lack of security and data privacy could lead to a whole host of other issues

Some others, however, do not want unfounded fears and/or misinformation to derail what they consider a legitimate improvement in transportation. Finally – and perhaps most importantly – most recognized that public education will be key.

Many of the respondents had multiple, intersecting interest. For example, safety advocates were also interested in accessibility, equity and mobility. Top of mind interests that compelled these individuals to participate in this survey varied, but aspects of technology and safety were mentioned by several in each group.

Sample Comments

When asked the question, “By clicking into this survey, we assume this topic is of interest to you. Please explain why this is the case” the following sample responses were submitted.



General public quotations

- Concerned about the status of bicycles on streets. Looking forward to safer streets.
- Work on it now so someday our roads will be safer and as I age the hope of keeping independence longer by not losing the ability to get around town.
- I have hopes that CAVs will control the too-frequently rushed, distracted auto drivers that routinely cause safety and frustration to those who chose not to (or limit) driving.
- As a person who is blind, not being able to drive is one of the most significant barriers to full equality; it affects employment, where I choose to live, how I shop, and where I go, or don't go on vacation.
- I think we need to keep up with other states in embracing this technology.
- I like to go places and am concerned about what that will look like, especially being more in a more rural area (no regular mass transit options more than once a week).
- Most media coverage presents CAV as a technology as an accomplished feat that is only waiting for a few technical improvements to be fully implemented. The MnDOT website lists speaks glowingly about the technology and 10 "Benefits of automated vehicle technology". NONE of these addresses the very real issues, problems and dangers of rushing to embrace this embryonic idea.



Stakeholder quotations

- I am employed in Mass Transit and as such have a vested interest in moving people around now and in the future.
- I live car-free and ride my bike everywhere. I am concerned about how automated vehicles will interact with people riding bikes, walking, and rolling.

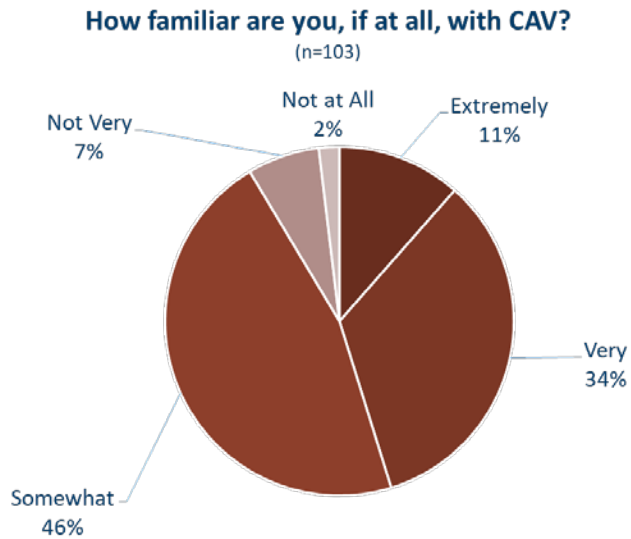
- I work in transportation planning in a rural area, and also focus on bicycle and pedestrian issues, so this is a topic that is of great interest to me. I'm both concerned and fascinated by the prospect of CAVs.
- I'm a transportation engineer interested to see how this new technology will improve our transportation system in safety and efficiency.
- It's the future. I like planning ahead. It could completely change where I live/work with the opportunities that automated driving would allow. e.g. Doing work on the way to work.
- I believe CAV has the potential to deliver vast safety benefits.
- I'm interested in how we move away from a world where the expectation is that every person should aspire to own a motor vehicle.



Technical expert quotations

- CAVs are an opportunity to increase roadway safety, reduce congestion, reduce the number of vehicles on the roads, and reduce emissions.
- I am extremely concerned about the premature approval of fully automated vehicles.
- I've spent most of my engineering career evaluating the safety of complex systems such as automotives, aircrafts, ships, and process control equipment.
- I am a transportation planning researcher and I want to see CAVs POSITIVELY affect our land use and transportation infrastructure in the future. I am specifically interested in the consumer economics of CAVs. How can we build a system that increases accessibility without inducing longer, more frequent trips? A mileage-based fee and/or congestion pricing that builds off of the current ride-share framework would be well suited for curbing vehicle use as they become easier to access.
- I am involved in research at the University of Minnesota, and view CAVs as instrumental in moving Minnesota's transportation system forward.

Familiarity with CAV



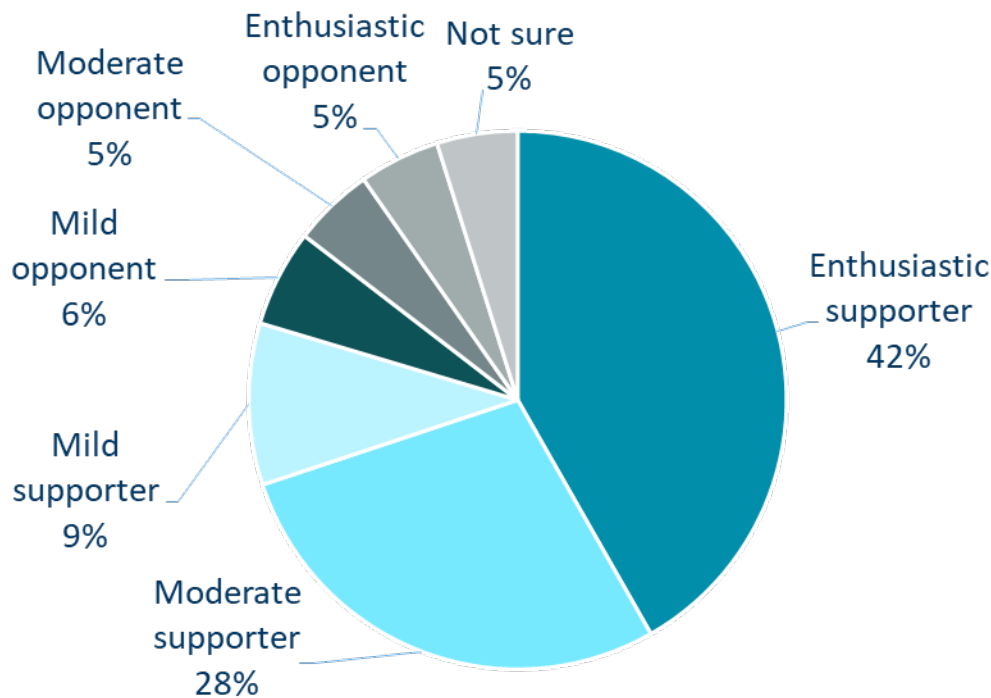
Overall, there was moderate familiarity among respondents but it varied considerably by group, with the technical experts being quite familiar.

Of the respondents, 90 percent of technical experts were familiar with CAV, 50 percent of the stakeholders were familiar, and only 25 percent of the general public felt they were extremely or very familiar with CAV.

Public Supportive of CAV

Overall, respondents were supportive of CAV - the general public group was a little less enthusiastic about the idea of allowing CAV in MN (which is likely driven by lower familiarity).

At this point, how do you feel about allowing/using CAVs in MN? (n=103)



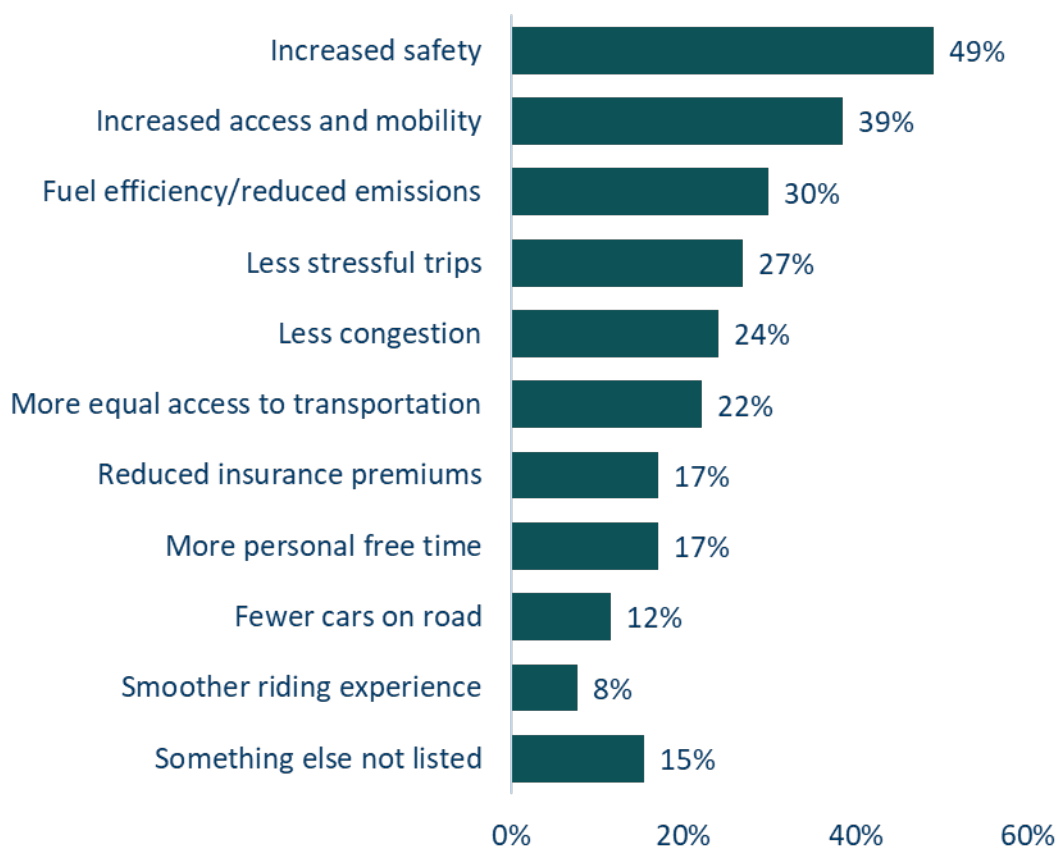
Safety benefits

Safety was the predominant top of mind benefit. Nearly half the general public, technical experts and stakeholders felt that CAV would make the roads safer and that this was the main benefit of allowing CAVs in Minnesota. After safety, the following benefits were recognized (in order of priority):

- Increased accessibility, mobility and independence
- Better traffic flow, less congestion, increased capacity
- Cost savings (e.g. shared rides, off peak traveling, more profits for organizations and agricultural industry)
- Personal time savings
- Environmental benefits, e.g. sustainability and fuel efficiency
- Improved land use

- Innovation and getting Minnesota involved in the conversation

Which of the following, if any, do you see as other major benefits of allowing/using CAVs in Minnesota? (AIDED - Select up to 3)

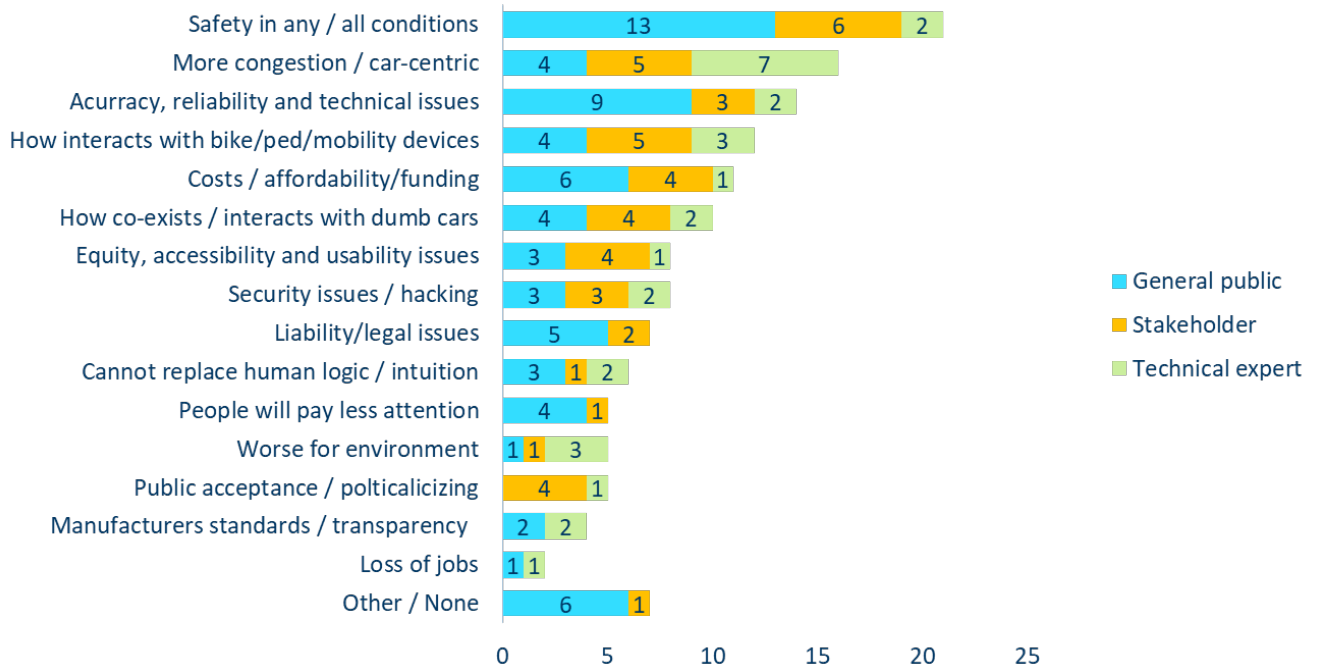


Safety concerns

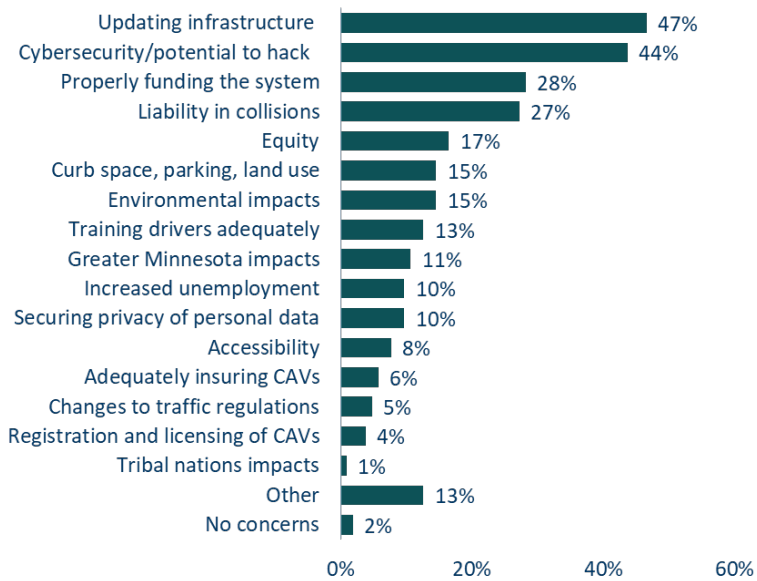
While recognizing the potential for CAV to improve safety, respondents also recognized the challenges automation poses. Safety issues also topped the list of concerns, along with concerns about CAV making MN more car-centric, technical difficulties, the technology not “playing nice” with others and costs.

What is your main concern about allowing/using CAVs in Minnesota? UNAIDED/CODED

(counts per code (multiple codes per person allowed))



Which of the following, if any, do you see as major concerns of allowing/using CAVs in Minnesota? (AIDED - Select up to 3)



When chosen from a list, respondents noted that updating infrastructure, cyber security, funding and liability were the most important risks.

Policy Specific Comments and Concerns

The survey asked respondents to group their concerns by topic, starting with transportation infrastructure and investment. Below is a summary of verbatim comments by policy area.

1. Transportation Infrastructure and Investment

Suggestions on changes to law, rules and policy

- General Public
 - MN has an opportunity to get ahead of other states/regions. Bureaucratic backlog could kill this.
 - Need gradual transition to driverless buses. Keep drivers behind a remote wheel +in touch with riders.
 - Bicycles and pedestrians need to have access to every street as they do now.
 - Bicycles and pedestrians need to have access to every street as they do now.
 - Bicycles and pedestrians need to have access to every street as they do now.
 - All the rebuilding now does NOT seem to take CAV into account. Build proactively vs after-the-fact.
 - Drivers before cars, people before computers.
 - The industry is coming up with creative solutions for transporting people and things.
 - Public outreach to demonstrate practical benefits of taxes/fees for CAV infrastructure investment.
- Stakeholders
 - Come up with binding policies that dictate what infrastructure is needed and how it will be funded.
 - Give incentives to business for creation and improvement of the technology to get fully automated.
 - Give incentives to business for creation and improvement of the technology to get fully automated.
 - Commitment to maintenance will be even more critical than before.
 - Conduct pilots.
 - Don't take away infrastructure from bike/ped to accommodate CAV. Maybe even add bike/ped inf.!
 - Smart infrastructure that talks to CAV - e.g. signals.
 - Conduct pilots.
 - Designate lanes as CAV-Only.
 - Will CAV actually increase the number of vehicles on the road to support our demand for access?
 - Mileage based user fees. Not tolling.

- Need to find a way to subsidize transportation infrastructure apart from the gas tax.
- This will need to be addressed. CAV Mileage/Toll taxes.
- Isn't most rutting caused by Heavy Commercial (HC) vehicles? Program lane adjustments on HC.
- This will need to be addressed. Pave only the tracks that are traveled on and make them thicker.
-
- Technical Experts
 - Give incentives to business for creation and improvement of the technology to get fully automated.
 - Give incentives to business for creation and improvement of the technology to get fully automated.
 - Better infrastructure protecting vulnerable users.
 - Integrate 5g wireless into infrastructure investments.
 - Other infrastructure needs to be equipped with technology to allow communication with other elements.
 - Road markings and signs need to be PERFECT for AVs to work right. Maintenance funding needs to change.
 - We need more sensors at intersection to detect people in the crosswalk rather than just a set time!
 - A VMT fee and a decongestion fee. CAVs will have the hardware to accomplish this.
 - Dedicated CAV/Transit lanes.
 - Increased use of in-vehicle messages as the fleet turns over may smooth the transition.
 - Carbon tax
 - Ensure CAVs have technology to allow per mile fees.
 - Road user fees. Gas consumption tax is not enough and is non-equitable. Rich=better car=less cost.
 - Usage fees and congestion pricing, essentially doing what the gas tax was meant for.
 - VMT/public roadway use fees, open seat fees, congestion fees.
 - Improvements to pavement design that consider or even take advantage of CAV programming.
 - Require vehicle makers to add a randomness/variance in where the car travels within the lane.
 - This is an unknown assumption that greatly depends on market penetration.
 - Mandate basic data sharing for more effective transportation planning & investment.

2. Safety

- General public
 - Always require an attentive driver, even if auto pilot is engaged.
 - Do not allow a vehicle to leave its lane under its own control, only allow braking. Need more space.
 - Eventually designate CAV-exclusive lanes/routes to allow for greater use/testing.
 - Has to have some kind of transition to driverless. Need remote backup capability.
 - Limit to freeways/highways initially.

- Operating on rural roads only.
- Test in all weather conditions.
- Test in areas isolated from human powered roadway users.
- Test it for years, literally.
- Stakeholders
 - Clearly mark vehicles that are CAVs. Educate the public on any issues there might be with the CAVs.
 - Create CAV zones where testing is allowed and maximum protections have been put into place.
 - Make sure CAV's can adequately perform during snowfall and blowing snow before allowing them on streets.
 - Spend the dollars to test it in many environments. Incentivize it for business for earlier adoption.
 - Test CAVs sharing the road with people walking & biking at different speeds & with different sizes.
 - Trained drivers should be used vs. allowing just anyone to be a "test driver."
- Technical experts
 - Automated enforcement (speed cameras), reduced speed limits, protected bike lanes, better ped space.
 - CAVs likely should not be labeled -- labels may cause people to drive differently or erratically.
 - Controlled testing environment. Independent safety evaluations. Qualified safety engineers.
 - CVs have no issues other than adequate road com infr. AVs 2 be intro in transit/freight first.
 - Ensure drivers understand the capabilities of CAVs as the technology evolves.
 - Hire focused in-vehicle testers to not follow the faults in Arizona.
 - Phased implementation.
 - Require a human monitor.
 -

3. Traffic Regulations and Safety

- General Public
 - Can of worms here - I can envision "Automated Vehicles Only" signs on certain roads.
 - Need to make sure individuals are held accountable for blatant disregard for traffic rules, inc peds.
 - Please do not accept test data from AZ and TX. Make sure it works in MN.
 - Again, CAV rules have to be national. Can't change rules when vehicle crosses state line.
 - I am concerned about communication about inevitable accidents/incidents. Bad press kills good ideas.
 - Jaywalking enforcement would need to be increased.
- Stakeholders
 - Human drivers may become the "rogue element" in an otherwise orderly system. Needs to be considered.
 - See <https://www.strongtowns.org/journal/2018/4/2/automated-vehicles>.
- Technical expert

- CAVs are mostly only desirable if they're safer. Don't do tech for tech's sake.
- Have an independent safety authority of engineering professionals at the state level.
- More research and field tests.
- Require fail-safes such as manual overrides.
- While CAVs will change the nature of motor vehicles, presumably other modes won't change much.
- Allow platooning, allow unlicensed passenger.
- Might explicitly require that CAVs follow posted speed limits, exactly.
- Pass legislation that a single vehicle computer is as liable as the a single driver.
- Revise statutes for the different levels of autonomy or software control categories (Asimov's Laws).
- Statute 169.18 Subd. 8 would have to be updated for CAV, they can follow closer while being safe.
- Stop using the 85th percentile rule to set speed limits, allow cities to lower their speed limits.
- CVs need roadway infrastructure so build dedicated corridors. AVs allow only transit and freight.
- Require safety reports (See CA regs).
- We need functional safety engineers trained in IEC 61508 and ISO26262 to evaluate at the state level.

4. Land Use and Planning

- General public
 - By not driving/operating, people may live far from services/jobs. Consider infrastructure costs/environment.
 - Decrease drive time will lead to sprawl. Even without driving there's a limit on how long you'll ride.
 - If user share rides. Don't plan for a drop until trend starts.
 - Less need only if emphasize sharing vs solo ownership.
 - Assumes cars will be stored away from curb--but must not be at expense of congestion.
 - Opposite. While not in use or moving to next pickup they will need to park to conserve fuel.
- Stakeholders
 - Agreed - greater mobility will lead to urban sprawl, to the detriment of society
 - How space can be reallocated or saved in the roadway with CAVs.
 - Shape settlement patterns through policy. Don't allow unmitigated sprawl.
 - This will happen if shared ownership models are not encouraged.
 - Cities will need help updating ordinances - too many are obsessed with providing (too much) parking!
 - Establish a policy response to anticipated redevelopment of parking ramps.
 - We can use spaces that currently are available for parking to build more housing and businesses.
 - I actually think the opposite might be true - better rural transit via CAV is a possibility!
 - CAVs are appropriate for the open road - highways and freeways, not for settings in cities or towns.

- Consideration of road space needs to be for MV travel lanes, & where other system users can increase.
- Identify pilot areas like Rice Creek Commons where testing leads to model policies/strategies.
- Technical experts
 - A decongestion and VMT fee will mitigate this risk. Encouraging taxi-like service will also help.
 - Require the cost to rent/own a CAV more the further from the city center. A concentric zone system.
 - Shared CAVs will lead to less sprawl than owned CAVs. This is an environmental issue.
 - Take advantage of current ride-share models to bring about mileage-base and congestion based pricing.
 - Urban growth boundaries.
 - We have to be very careful of this -- and strongly encourage CAV rideshare, CAV taxicab and TNC use.
 - We need greater controls and to price trips to discourage sprawl.
 - Either there will be giant parking lots on outskirts, or CAVs will cycle endlessly near destinations.
 - Parking lots will no longer need to be within walking distance of final destination.
 - Reduced parking is largely contingent on the deployment of AV taxis.
 - State should work with a group of planners to provide guidance on this and a number of topics.
 - Stop building parking.
 - Transition plans for parking lots/garages. New uses for curb space.
 - We need to aim for this with CAV rideshare. CAV personal vehicles are not the solution.
 - Demand will shift from parking to drop-off. Whether demand will decrease is TBD.
 - False. Pick up/drop off space will be in higher demand - then the car parks itself (or circulates).
 - Reallocate land to people walking, biking, scootering, pick up/drop off, greenspace + placemaking.
 - Space for curbside parking can be allocated to bike/ped/commercial usage.
 - Fund public transportation.
 - State could mandate or subsidize a minimum level of rural service.
 - CAVs might reduce the negatives of living in a dense urban environment
 - Support this while ensuring affordable housing, greenspace, placemaking, and safe streets.
 - We also need to aim for densification. CAV should augment mass transit, not replace it.
 - Increased use of CAVs allows for decreased minimum parking requirements for buildings.
 - Time importance not gone, but lessens w CAVs. Physical proximity less important than nice "place."

5. Accessibility and Equity

- General Public
 - Address historic, ongoing, status-quo racism in transportation decision making.
 - Current laws on equality should be sufficient. Pubic CAV buses should be looked at in the future.
 - Each vehicle should have built in cameras to ensure safety.

- Essential that blind people be given access to CAV.
- People with disabilities, particularly blind people must have access to these vehicles.
- If, for example, extra time is needed entering or exiting a vehicle before it moves.
- Require all CAV operating systems operate at the same level of independence on all roads.
- Dedicated funding would need to be distributed evenly throughout the state to ensure the rural areas.
- Laws must promote access for marginalized communities.
- Put communities of color front and center in the decision making process, beyond token representation.
- This isn't a concern until it's standard. Most communities will have limited access until costs drop.
- I'm not sure why the initial thought is they would have limitation unless their lands don't want it.
- Must work closely with tribal governments.
- All Minnesotans must have access to these vehicles regardless of color, age, disability, or socioeconomic status.
- If needed, subsidies must be included to make sure of access.
- Problem for the industry to answer by finding a way to make it affordable without taxpayer money.
- This is a limit area now and will be for the next decade. All people will have limited access.
- Stakeholders
 - There should be as much testing done in rural areas and small towns as in the metro.
 - Important to design with all ages and abilities in mind (universal design).
 - How people unable to afford the technology are impacted.
- Technical Experts
 - Ensure insuring vehicles owned by POC are non-discriminatory.
 - Fund highways with a per mile fee and stop drawing taxes from people who don't drive.
 - Increased funding for public transportation.
 - A good system shouldn't rely on heavy infrastructure improvements making it accessible everywhere.
 - Have better representation.
 - Not tying access to the vehicles to smartphones or credit cards.
 - Implement a MN transportation union or some way to use human capital to protect users.
 - Not tying access to the vehicles to smartphones or credit cards.
 - Shared AVs should be encouraged so as to not require/promote AV ownership.

6. Cyber Security and Data Privacy

- General Public
 - How can we trust the same agencies that gave us MNLARS?
 - Ban collection of travel data sharing.
 - Keep unconnected from social media, force opt-in's for data capture not opt-outs.

- User's should be able to control the sharing of ALL user data.
- Cooperation problem. The need to be able to communicate with other CAVs on the road.
- Maintaining personal information is paramount to business innovation.
- Notifications should only be presented when the Connected Vehicle is stopped, users can disable.
- Don't store it! Bias on side of not storing data rather than current trend of capture-everything.
- Storage of the data should not be a government concern; consumers of the data should deal with this.
- What needs to be stored? Local storage only for user access only. Central database of infrastructure.
- If Equifax can't keep data private, what makes us think state gov't can?? PROVE state gov't can.
- Security should be built in at each step of the process, don't leave this for last.
- Communication needs to be encrypted and end-points validated (both directions).
- Lot devices are notoriously weak to hacking and malware. What will make CAV different?
- Manufacturers must be held accountable for extensive security testing.
- Override/ disconnect to full autonomous manual driving requirements.
- The person in the CAV must be able to maintain a certain amount of control of what it does.
- This is the scary part. Vehicle will need to use GPS - so how do you lock down the entire globe?
- The idea of somebody hacking CAV is VERY scary. I'm not an expert and this needs to be 100% safe.
- Stakeholders
 - Create legal infrastructure that REQUIRES CAV-related security and privacy before allowed on road.
 - There are plenty of rules around cyber security and data privacy that could be copied for CAVs.
- Technical Experts
 - Requirements for manufacturers to obtain product security certifications.
 - Require 3rd party security certifications of systems and equipment from an ANSI accredited auditor.
 - Many hacking problems are the result of poor software design and user error. Both must be addressed.
 - Require cyber security standards similar to the process control industry.

7. Economic Development and Business Opportunities

- General public
 - Must be included in Voc Rehab rules so that access to transportation can help employment for disabled.
 - Seems to me like federal standards are needed. Can't have different CAV in each state.
- Stakeholders
 - Make sure we reap the benefits locally and inclusively.
 - Support local companies in scaling up their role in the national & international CAV industry.

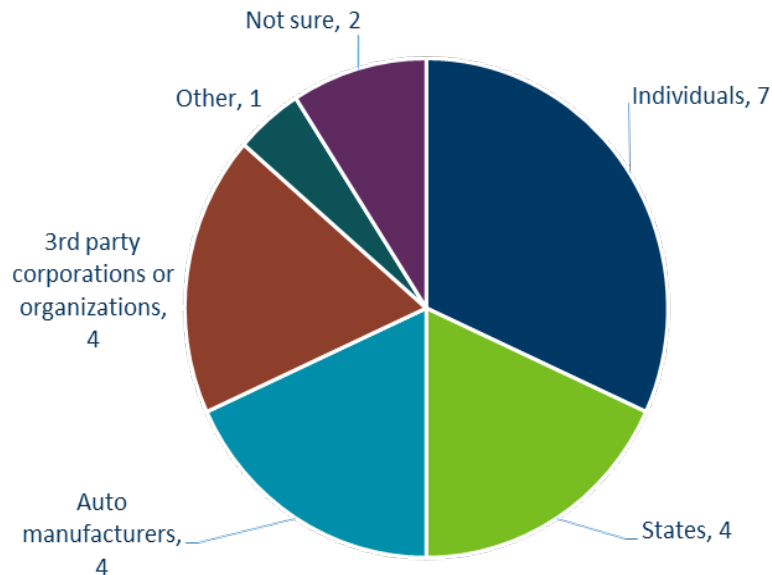
- Work with industry to keep interests aligned. Businesses will move to markets of least resistance.
- I'm not too concerned about it - we have severe labor shortages already. They'll find jobs.
- Invest in training and workforce development to buffer the transition.
- Technical experts
 - Being early adopters is nice, but it's far more important to adopt CAVs RIGHT.
 - Facilitate the opportunity to test CAVs in urban conditions during winter.
 - Huge opportunity to attract startups focused on hardware and software components of CAVs.
 - Keep making it a great place to live with good education, jobs and services.
 - Truck drivers less important, but still need loading/unloading personnel. Shipping at any hour?
 - Large businesses might have own fleets of CAVs as an employee amenity (like corporate car for all).
 - Work with the industry to facilitate overnight delivery systems infrastructure.

8. Environmental Impacts

- General public
 - Do not lose sight of potential for greater congestion/pollution--emphasize sharing options.
 - Identify standards for universal, quick charging stations, working with auto makers.
 - Autonomous goods transportation could be the greatest opportunity here.
 - Do not lose sight of potential for greater congestion/pollution--emphasize sharing options.
 - Less, more efficient, trips can only help.
 - Your assumption is there will be a change in the mindset about owning your own vehicle.
 - Electricity still has environmental concerns; emphasize sharing/transit CAVs vs solo ownership.
- Technical experts
 - Support car sharing systems.
 - This will not happen unless we implement regulations to ensure this happens (TDM/CTR laws, fees).
 - Again, take advantage of consumers willingness to pay for current ride-share trips and deploy w/CAVs.
 - Encourage VMT & decongestion pricing, encourage AV taxi services.
 - Need to change how the vehicles are powered.
 - This is especially true if CAVs are owned more than shared.
 - We can avoid this by planning for the future we want. More people walking, biking, + shared mobility.
 - CAVs must be EVs (and they probably will be) - there might be govt role to encourage this.
 - CAVs should be electric, we should always frame our CAV conversation around an electric fleet.
 - Electrify the fleet.
 - Encourage electric vehicles, expand charging infrastructure.
 - if we move to shared use mobility, people won't be charging at home. Are we planning for that?
 - CAVs must be EVs (and they probably will be) - there might be govt role to encourage this
 - Expand charging infrastructure, establish carbon fee.

- Stop subsidizing parking.
- Fewer miles driven means less Env. impact. Electric and mileage-based charge will ensure sustainable.
- Require electric AVs.

Who do you feel should legally own an automated vehicle? (n=9 (very small sample))



9. Vehicle Registration, Driver Training and Licensing

- General public
 - A CAV should not differ from non-CAV for registration and title.
 - The existing license classes should include CAV; a new class could provide for CAV only operation.
 - All drivers should include knowledge of how to intervene and take control of a CAV.
 - Driving teachers must become experts on these new technologies and practice use with students.
 - Driving test as they are should continue to stand.

10. Insurance and Liability

- General public
 - The rules must be adjusted - assign liability where it belongs, but the insurance industry will fight.
 - Insurance companies will need to recognize the reduced risk of an accident.
 - Will it really reduce insurance premiums?

- There you go - more (not less) insurance will probably be needed.
- Stakeholders
 - How will the system accommodate oversize/overweight loads?

11. Workforce Preparation

- General public
 - Need plan for long-term transition to driverless taxis, buses, trucks, delivery vans.
- Stakeholders
 - Coordination among all levels of educational institutions required to address topic
 - We are already working with universities to develop training programs for service of CAVs.
 - It is a new and exciting industry. Geographies that accommodate will receive the economic benefits.
- Technical experts
 - Universal basic income.
 - Communicate and demonstrate that the state is a leader in CAVs.
 - State Universities and Colleges must do a better job of training future workers in this area.
 -

Additional Policy Suggestions

Below is a verbatim compilation of the miscellaneous feedback received from the public.

- Definition of legal road markings or signs, definition of motor vehicle, definition of driver.
If this is implemented, CAV companies must be held liable for injuries, death, and damages.
- Must be done in conjunction with other states and Fed authorities (e.g., interstate hiway system).
- Laws protect public transit, require CAVs to share data, prohibit leasing public streets for private use.
- Please incentivize the use of shared-ownership platforms
- Congestion pricing could be implemented to help discourage frivolous, extra CAV trips.
Create laws that discourage driving alone.
- Ideally, CAVs could provide info on # of occupants so as to encourage HOV use, enforcement.
- Policies and laws should put people first and reduce the ability to limit bike/ped movements.
- Require infrastructure improvement to integrate autonomous systems onto our roadways and sidewalks.

- Signage would be clear as to when you're in an area of CAV connectivity.
- I feel that CAV allows drivers to intentionally be less responsible behind the wheel.
- Many people see this as inevitable. By 2060 might be total autonomous in MN cities and hiways.

What is current status/regulations in MN regarding testing of these vehicles?

- When will this project start?
- Just to emphasize bike/ped and rural considerations as CAVs are implemented.
- Pilots could be defined to explore different conditions for CAV integration (urban, new town, rural)
- Planners need to know how to adjust trip generation and distribution in their traffic models.
- Progress needs to be made at a faster pace on adoption of CAVs in MN.
- As awareness of this increases, please stay strong and explore this technology.
- CAVs are as much about human factors as they are about technology and regulations.
- Happy to look at curriculum development needs and opportunities in this area focused on data science.
- Seek out help from safety engineering organizations. We do this every day.

Is there anything you want to learn about?

- The big Qs: Shared? Electric? Taxable per mile?
- The Zipper Merge needs help, like a light in each lane to let the driver proceed.
- A way for vehicle occupants, not being operators, to still communicate manually/at will with peds.
- Expanding the rider trains in the metro area. May there be a cost comparison between the two?
- How are these concerns going to be addressed and safety be guaranteed?
- Is MN going it alone or consulting with other states and/or Fed agencies?
- It would be helpful if there was a listserv for this project, instead of emailing the director.
- Timelines. When CAV will be on the roads.
- Vehicle to Vehicle communication.
- What policy changes are being proposed at the current time.

- What the state sees as its role in getting ready for the eventual shift.
- Where will funding come from?
- Why on earth is the state considering this when there are so many other issues facing Minnesota?
- How CAVs will be tested with people walking, biking, & rolling?
- I'd like to know how I can speed things along!
- Policy options for mitigating urban sprawl as CAVs become more common and affordable.
- The minutes from the meetings that have occurred on this topic.
- Who are the local players in MN? Who is active in the space, and how are they regulated?
- Current effort to assess land use impacts due to CAVs.
- How the state and local governments plan to make use of the technology in their fleets.
- Incentives by utilities and PUC to make it a smooth transition.
- Plans for moving ahead with testing on our roadways would be good to share with safety organizations.

Demographics

A majority of the respondents found the survey through email or the MnDOT website with a smaller portion finding it on social media. Sixty-four percent of the respondents were male while 33 percent were female with some preferring not to specify. A quarter of the respondents were ages 35-44, with 21 percent ages 25-34, 21% ages 45-54 and 19 percent ages 55-64. Nearly 89 percent of the respondents were white, followed by persons who identified as Black or African-American. Finally, 36 percent possessed a post-graduate degree, while 38 percent had a college degree and 10 percent had some college or technical school. Over 90 percent of the respondents owned a car, while 80 percent owned a bicycle.

Appendix – Detailed Comments

Why this issue is important to Minnesotans

Below is a detailed summary of verbatim survey responses when respondents were asked the question why this topic is of interest to them.

- Active pedestrian and cyclist interested in interactions with these vehicles.
- Bicycle/Safety Advocate.
- Concerned about the status of bicycles on streets. Looking forward to safer streets.
- I am a bicycle and walking advocate and CAV's have the potential to impact my work both positively and negatively.
- I bike and walk. Autonomous vehicles scare me.
- Safety for bicyclists.
- I have hopes that CAVs will control the too-frequently rushed, distracted auto drivers that routinely cause safety and frustration to those who chose not to drive (or limit driving).
- Public safety issue Distracted driving.
- I believe CAVs have no business on America's streets. The push for CAVs is pinned on the hopes that technology will greatly improve in the near future to make these types of vehicles safe. Although they are currently being tested, results have been mixed as to the safety of these vehicles. They are currently and likely will never be 100% safe, unless human operated vehicles are outlawed entirely. Hackers and governments have already proven the capabilities of hacking and bringing down autonomous drone aircraft; it is no stretch of the imagination to think that it couldn't happen to CAVs. Humanity is rapidly becoming too reliant on technology, sort of like putting all our eggs in one basket. Internet outages occur, and it is no doubt a target of terrorists. The Russians hacked into voting machines during the 2016 election, what would stop them or anyone, for that matter, from causing chaos in the American transportation system by targeting the Internet? Where is the money going to come from to put the infrastructure in place? There are far more important issues facing Minnesotans than preparing for CAVs. Ever heard of health care? Decent affordable housing? Adequately funding education? Replacing Minnesota's crumbling infrastructure? The problems associated with an aging population? It is going to come down to what is more important: humans or technology. Will victims or survivors be able to sue for the damages, injuries, and deaths that will inevitably be caused by CAVs? Or will companies utilizing CAV technology be free from all liability and given a free pass when someone is injured or dies as direct result of the technology?

- While I've always wanted to have my car drive me to work while I get ready for the day, it's hard for me to comprehend how it's going to work safely.
- Work on it now so someday our roads will be safer and as I age the hope of keeping independence longer by not losing the ability to get around town.
- Technology is my interest and my career. I'm interested in autonomous vehicles as well as advanced power options. I have seriously considered purchasing vehicles with early autonomous functions and have discussed their possible uses for those with difficulty driving or medical conditions that prevent them from doing so.
- I think we need to keep up with other states in embracing this technology.
- I want the best for my kiddo. Transportation is one of the largest expenditures in society. I want my kiddo and other people's kiddos well positioned to have a great life.
- I work in the transportation and urban planning field. I am also an interested citizen and look forward to the deployment of AVs in the near future. And as a parent of younger children, I anticipate AVs will be part of their driving future.
- I'm always interested in emerging technology and how it will impact my city and life.
- Minnesota is a growing, vital state. We must keep up with future trends and continue to be welcoming.
- Most media coverage presents CAV as a technology as an accomplished feat that is only waiting for a few technical improvements to be fully implemented. The MnDOT website lists speaks glowingly about the technology and 10 "Benefits of automated vehicle technology". NONE of these addresses the very real issues, problems and dangers of rushing to embrace this embryonic idea. Problems like significantly increased road wear when autopilot vehicles follow exactly the same on the roadway. Decreased or disallowed mobility access in greater MN when 'smart cars' refuse to acknowledge and access rural roads. Safety issues such as when driver less cars are not able to navigate in our winter weather, or worse when they tell us that the roads are not suitable to drive, except I need to get to the doctor, or hospital.
- As a licensed driver for over 3 decades, I have witnessed a few accidents and been hit by a distracted driver. The amount of time I have spent behind the wheel adds up to a significant amount of my life that I will not get back. I enjoy driving, but not at the level of time commitment needed to navigate the necessary daily regime. If the MTC is not able or willing to move forward with extensive expansion of our rail system, either new light rail or adding rider lines to existing heavy rail tracks around the twin cities, then the next step for safety officer. Our roads and to gain time back is to be proactive with a plan to adopt driverless vehicles here.
- As a blind person, self driving cars will open up many opportunities for blind people that we have not previously had.

- As a person who is blind, not being able to drive is one of the most significant barriers to full equality; it affects employment, where I choose to live, how I shop, and where I go, or don't go on vacation.
- Attempting to be a voice of reason as we head toward this slippery slope.
- Because I use Minnesota roads, and am interested in who/what else might also be using those roads.
- CAVs will have an enormous impact on my day to day life.
- Commuter in congestion.
- Concerned about introducing more distractions to the driver (e.g. marketing messages as I drive by businesses, notifications to the driver about non-driving concerns). Also concerned about the security between connected cars and how the system prevents unauthorized data from being maliciously injected.
- Curious on how MNGOV will regulate this technology.
- I am a former public information officer for the Arizona Department of Transportation and a current Minnesota resident. At ADOT, I was involved in communicating the agency's R&D of connected vehicle technology as well as its support of autonomous vehicle testing in Arizona. I want to support CAV technology in Minnesota.
- I am a legally blind person who cannot drive. I'm open to every type of transportation that will help blind and visually impaired people get around independently, so we can be productive citizens to society.
- As a blind person that opportunity for a new form of transportation.
- I am a tax-paying, law-abiding citizen who uses public roadways multiple times each day.
- I like to go places and am concerned about what that will look like, especially being more in a more rural area (no regular mass transit options more than once a week).
- I work for a large fleet company.
- I'm interested in autonomous vehicles, vehicle sharing, and transportation in general.
- I'm interested in the future of transportation.
- Intense road congestion on my travels to and from work. I'm hoping this will help in the long run.
- It is of interest as we, the people of Minnesota, will be affected by whatever is decided. I want to be proactive in the process.
- It is our future.

- My friend works at a company developing products for autonomous buses. I know it's inevitable that driverless buses will come, and want to know how they are going to be implemented.
- The policy focus areas of Insurance & Liability, Accessibility & Equity, and Planning & Land Use are of particular interest to me.
- These vehicles use the same roads that I do.
- This technology will only develop and grow in the coming years and we're stuck with it whether we like it or not and whether it works well or not. So we need to have a POV and give input on what we want from it, safety and hacking concerns, and who/how will fund infrastructure to support (and react to) it.
- Transportation efficiency and safety.
- Human safety and responsibility.
- I'm concerned about safety on the roads with autonomous vehicles
- Someday like to buy an automated vehicle and look forward to the safety improvements it would provide.
- As a rural county highway engineer, the potential impact could be significant to future projects, funding, policies, and planning.
- As an executive of a business that relies on MnDOT's network of roadway's to make a living, I believe it is important to weigh-in on this topic.
- As someone who works in urban planning and development, CAV is an important future systems topic that I want to be engaged with. It's a technology that will impact my work directly.
- I am a transportation planner at an MPO.
- I am employed in Mass Transit and as such have a vested interest in moving people around now and in the future.
- I am interested in how CAVs will function around vulnerable transportation system users - like people walking and bicycling.
- I am personally interested in CAV and I also work with pavement markings, which might be affected by CAV use.
- I am the Executive Director of Commuter Services and the I-494 Corridor Commission. We encourage commuters to utilize alternative transportation rather than drive alone and provide a vast array of free resources and services to help individuals find or start a carpool, or vanpool as well as try transit, bicycle commuting and telework. A majority of our outreach is done via large employers and multi-tenant office buildings. Commuter Services is seen as the "one stop" source for information and resources related to commuting. At the 130 commuter fairs we had people ask us about driverless cars - so there are

hundreds of opportunities for one-on-one conversations. The I-494 Corridor Commission is concerned about connected and autonomous vehicles from a safety perspective with their issues with snow and blowing snow. Additionally, it only takes one car to cause a major backup or bottleneck on an interstate or highway, so the Corridor Commission is concerned from that perspective.

- I believe CAV has the potential to deliver vast safety benefits.
- I have disabilities and for a while my disability prevented me from driving. I hope that all people will have mobility and freedom to travel about as easily, and cheaper, than owning and operating a private automobile.
- I live car-free and ride my bike everywhere. I am concerned about how automated vehicles will interact with people riding bikes, walking, and rolling.
- I manage the ROW for the City of Eden Prairie.
- I represent construction companies that have hundreds of service trucks driving around the state every day.
- I work in local government, with a focus on bike and pedestrian planning and related policies.
- I work in the transportation industry. Plus, I am 56, and may want to make use of CAVs in the future.
- I work in transportation - specifically as an advocate and community organizer around biking, walking, and transit.
- I work in transportation planning in a rural area, and also focus on bicycle and pedestrian issues, so this is a topic that is of great interest to me. I'm both concerned and fascinated by the prospect of CAVs.
- I work in transportation research.
- I work within the transportation industry; I also have a personal interest in future technologies and especially future transportation technologies.
- I'm a transportation engineer interested to see how this new technology will improve our transportation system in safety and efficiency.
- I'm interested in how we move away from a world where the expectation is that every person should aspire to own a motor vehicle.
- I'm on the board of our local transit authority and working on the long range transportation plan for the MPO. Autonomous vehicles have big implications for both.
- Improve transportation options for my household.
- It's the future. I like planning ahead. It could completely change where I live/work with the opportunities that automated driving would allow. e.g. Doing work on the way to work.

- The Metropolitan Airports Commission needs to keep abreast of CAV and the possible impacts at our facilities.
- Transportation Professional.
- We manufacture an autonomous power platform for the agriculture sector. While operations within a private field are largely unregulated, the platform still needs to move from field to field, often utilizing a public road at some point.
- We need to plan and prepare for future transportation developments.
- Work in the field of transportation. Am a Twin Cities resident who deals with traffic and congestion every day.
- I'm interested in how automated technology can help reduce pedestrian and bicyclist fatalities in MN.
- I am a transportation planning researcher and I want to see CAVs POSITIVELY affect our land use and transportation infrastructure in the future. I am specifically interested in the consumer economics of CAVs. How can we build a system that increases accessibility without inducing longer, more frequent trips? A mileage-based fee and/or congestion pricing that builds off of the current ride-share framework would be well suited for curbing vehicle use as they become easier to access.
- Civil Engineer in Intelligent Transportation Systems field.
- City planner.
- I am a practitioner focused on the intersection of transportation and land use. Autonomous vehicles, if they achieve the right price point, will transform the transportation and land use landscape.
- I am a traffic/transportation research engineer at the University of Minnesota who is very engaged and interested with this topic. We are currently working on a Local Road Research Board project, which overlaps with this survey, that aims to provide guidance to local road operators to help them with long-term decisions as they relate to CAV. Much of our other research also relates to CAV and the evaluation of the underlying technology to help drive the development of infrastructure-based CAV applications.
- I'm a transportation and land use planner.
- Societal benefits and opportunities to change land use.
- CAVs are an opportunity to increase roadway safety, reduce congestion, reduce the number of vehicles on the roads, and reduce emissions.
- Employed as a Traffic Engineer.
- I am a City Administrator and a major state highway runs right through our downtown and by our biggest city park.

- I am a researcher and developed of CAV applications.
- I am a transportation planner in Minnesota.
- I am a transportation planner specializing in multimodal transportation.
- I am extremely concerned about the premature approval of fully automated Vehicles.
- I am involved in research at the University of Minnesota, and view CAVs as instrumental in moving Minnesota's transportation system forward.
- I believe that the automated vehicle needs to be studied more in depth. I don't believe there is enough information and data to support the automated vehicle in society right now.
- I have served as chair of the Energy Resiliency Advisory Board (ERAB) for Rice Creek Commons (RCC) in Arden Hills. The ERAB goal is to make RCC a sustainable energy community of the future. With it's location at Hwy's 10, I694 and I35W it is a perfect location to make it an electric vehicle showcase community with electric busses, EV's and autonomous electric vehicles and transportation.
- I spend much of my time studying, critiquing and writing and speaking about technology. CAV developments are at the top of the list that interest me and my readers and audience members.
- I work in the Civil Engineering/Traffic Engineering industry.
- I've spent most of my engineering career evaluating the safety of complex systems such as automotives, aircraft, ships, and process control equipment.

What do you feel are the benefits of CAV?

- There are no major benefits to CAVs to the average Minnesotan, especially rural Minnesotans. They will be a big money maker for the state government, corporations, and the Metro Area. The taxpayers will be the biggest losers. Insurance premiums will not go down for the vast majority of Minnesota drivers, and it is unlikely they will be any less for CAVs as there will be accidents involving them.
- They will create more equal access to transportation. Since most of them will be electric, they will reduce emissions.
- Transportation in rural areas is an issue across the state and CAVs could help alleviate that, if they recognize pedestrians and bicyclists then walking and biking would be safer with less cars on the road. As long as pricing allows equal access, I am all for it.
- We need to figure out what to do with all the existing, non-CAVs on the road. People won't give up their classic cars but their liability insurance may go thru the roof since their own human error will continue to cause more accidents in the future.

- All of the above. I would include adding more "driverless" trains on existing heavy rails and expanding of light rail to be a huge part of the safety, sustainability, and life satisfaction solution along with CAV's.
- All of these are excellent examples of why we should do this! Of course moving on implementation takes a lot of education the general public about the benefits. Too many people I feel will be reluctant to give up their cars....it is the "so-called" independence of this country. But this new shift will really create a new way.
- Car sharing, self/remote parking and more efficient routing could mean fewer cars consuming energy and infrastructure.
- CAVs will be able to optimize speed and routes to maximize fuel economy.
- For those people, who are used to rural driving, CAV will make it more comfortable to drive in the 'big city.' There will also be increased ease of mobility for emergency vehicles.
- Fuel efficiency.
- Hadn't even thought about the insurance premiums - good point!
- Have these outcomes been proven?
- Human beings are the best and worst thing about vehicles with engines. If everything is automated, then some idiot won't crash into me because s/he is texting while driving. but at the same time I want to be able to take my car or motorcycle out on the weekend for a drive, so the roads can't be 100 percent for automated cars. Cities and main highways, yes.
- As a blind person, it would allow me another choice and an opportunity to live more independently.
- I can see where if all vehicles were connected, that there may be less congestion due to maintaining safe following distances and not having to take as many evasive maneuvers.
- I like the idea of less costly insurance premiums, that would be a huge savings.
- I like to drive.
- I put "fewer cars on road," though I'm not entirely sure whether or not I believe that will be the case.
- I think there could be more cars on the roads.
- I would have selected all the choices if I could have. CAVs will have a massive positive effect on Minnesotans.
- I'd love to select increased safety, reduced insurance premiums, etc. but I do NOT perceive the technology as safe AT ALL yet. As well there is nothing inherent in the tech about more equal access to transportation -- if decisions get made in the typical, status quo systemically racist/classist way, then southwest and west suburbs will benefit, white communities will benefit, and affluent communities will

benefit, and North Minneapolis, rural MN, and dense urban centers won't. I want it noted that I say this as an affluent white person.

- If implemented well, automated vehicles could have a positive environmental impact; also, if implemented well, they could reduce disparities, especially for people with disabilities, but also for others without access to transit.
- It could help people that currently cannot, or should not, drive get places.
- It would help the economy in terms being able to get everybody to and from work and be able to use this transportation in the job itself.
- Less congestion means better quality of life.
- Less time spent idling on the freeway means more fuel-efficiency, smoother trips, with less stress.
- More personal free time is the only major benefit I see in allowing CAVs in Minnesota. To me, this is not reason enough, as one's personal free time should never take priority over the health and safety of other Minnesotans.
- Never thought of cost of insurance aspect. My premium is not based on mileage, but if this is true, then that is a nice benefit.
- None of these are guaranteed unless you take all human drivers off the road and remove remote access from the computers so hackers can not take over control. I would never ride in one of these.
- None of these have been demonstrated, far less proven.
- Safety is my priority, reduced insurance rates is next, and less stress when traveling is third. I presume there will be more travel as population increases, especially in metro areas, so anything to improve travel conditions is welcome. We also have weather issues to deal with....this wasn't mentioned in the list.
- As a blind person, it would allow me another choice and an opportunity to live more independently.
- There exists the potential for significant benefits if the system is implemented in a way that benefits all users of the transportation system.
- These all reinforce each other.
- These benefits won't happen without strong and meaningful regulations and policies.
- Without having to deal directly with congestion and the chance of less congestion, traveling will be more enjoyable. And for those who cannot drive but have the financial means, this would be a great way for them to get around.

- A service technician's main job is to fix equipment. Now they need to drive there to fix it. If they lose their ability to drive due to a DUI they are unemployable. With CAVs they could continue to be employed.
- CAVs do not discriminate, operate under the influence, experience "road rage", speed or disobey the rules of the road. They can only do what they are programmed to do barring any malfunctions or unauthorized access which would be the responsibility of the manufacturer.
- Human error is the main cause for crashes, so CAVs should be safer. Those who cannot drive, such as those with vision impairment, will have increased mobility. Smoother traffic flow may improve fuel efficiency and reduce emissions.
- I have concerns about equal access. Equal access for whom? Presumably, much of the technology will not be affordable to most, and we have to consider how that impacts or continues to create systematic inequities - especially if we consider who might be blamed for future crashes and is more vulnerable.
- I think CAVs need to be available as a low-cost ride sharing service in order to improve equity and accessibility for all people.
- Less congestion by optimizing the routes to different locations. Better for the environment by finding shorter routes. Fewer accidents caused by impaired, inattentive or unhealthy drivers.
- Less stressful trips and more free time are also major benefits along with safety and capacity.
- Mobility issues for all citizens will become extremely important as more people compete to live in our dense urban areas. CAV will provide better access to for all citizens to our limited ROW.
- More equal access to equal transportation.
- People might be more likely to take a trip, if the thought of taking the time to drive and the stress of traffic would otherwise sway them to stay at home. People with handicaps could have better access to transportation without losing the feeling of independence. I would not be convinced that there would be fewer cars on the road. However, with the connectivity of the vehicles, congestion could be less and parking areas may be less congested.
- Quite the opposite, CAV's are not going to take a car off the road. If a person was going to drive alone to work, the CAV is still one car for one passenger. If someone was going to drive to the grocery store - it doesn't matter how many people were going to be in the car with the person driving to the grocery store, a CAV is not going to take a car off the road.
- Safety is a huge one, though I think it will be harder to sell to the public! Driving a car gives you an illusion of control that you don't actually have. Really excited at the prospect of solving chronic congestion problems and also reducing emissions.

- Secondary to my desire for more environmentally friendly transportation and city structure, is my desire to experience less stress while driving across town. I frequently find myself in stressful driving environments, especially in the suburbs where average speeds are higher, I am sick of the "need for speed" that many drivers find normal.
- The potential to reduce human error is too good to pass up.
- They'll open the door to using public right of way for things other than parking and moving cars; more people will be able to travel more efficiently and at lower cost.
- We have an opportunity to increase mobility for those who currently may face a number of barriers, this can reduce social isolation and expand critical access to jobs and services.
- A major barrier to quality of life in cities is congestion and over-use of roadways, in addition to the externalities of emissions, smog, and air pollution. Properly regulated and implemented CAVs could serve to reduce all of these negatives associated with car travel.
- CAV's in my mind the Driver would still be in control, but connected and receive advance details of traffic ahead to control his/her vehicle in a more efficient, and safer manor.
- CAVs (especially AVs) will likely improve access to transportation for low-income people, the increasing elderly population, and those in rural areas that currently may have limited access to personal automobiles and public transportation. Removing the burden of driving will also likely make many trips less stressful because people won't have to personally negotiate congested and other difficult driving conditions. Without effective planning and policy though (and even potentially with it), the proliferation of CAVs (and again especially AVs) will likely make congestion worse and increase travel times due to the reduced "cost" of driving and the likelihood of converting trips using mass-transit to private AV trips, much like what has occurred recently with the rise of mobility service providers like Uber and Lyft.
- Congestion should be reduced due to vehicle platooning, potentially allowing for faster trips. People would be able to do other tasks during their ride if the vehicle was autonomous, or could "relax" more if the vehicle was partially automated (i.e. hands off wheel feet off pedals, but still attentive). Safety benefits would stem from humans having less interaction with the car, and only take over when absolutely necessary.
- CVs will also result in Fuel efficiency/reduced emissions, Less congestion. AVs will result in more congestion since they will ADD vehicles in the system. The AVs disrupt the current balance between personal single occupant vehicle trips mode and transit/ride-sharing mode. The perceived cost (time wasted, discomfort in congestion) of single vehicle rides will be reduced since you can let the car drive and you can do other more productive things. This, at least initially, will shift demand from transit and ride sharing to single person vehicle trips. Also HOT lanes will take a hit since the value of the HOT fee will be reduced.
- EV transportation is here to stay and will rapidly grow.

- Fewer cars on the road: for a variety of reasons, AV companies are more likely to launch taxi-services than sell their technology. Even if using an AV is cheaper than owning a car, people will likely make trips more thoughtfully and sparingly because they will feel transportation costs more acutely. Whereas today, we really only feel the costs of fuel even though true transportation costs are far higher. Further, AV deliveries can occur during off-peak hours. Increased access and mobility: AV will reduce barriers to travel for those who don't have the option of driving. More efficient land use patterns: Altering the way we experience the costs of travel will also impact that way land use decisions are made over time. Transportation costs will more directly impact housing and retail location decisions.
- I think CAV technology has the potential to increase driver safety in the long run.
- I think this will help people with mobility issues.
- Need to address reducing VMT.
- Not having to pilot a vehicle will allow passengers to focus on more productive activities, whether professional or recreational. Platooning vehicles will achieve greater mileage. Insurance premiums will decrease as crashes become less frequent.
- Our built environment requires a personal vehicle to access many areas. We should work to change this in every way possible, but a stop-gap for those without the ability to drive is access to a car that will drive for them.
- Our lab focuses on improving fuel efficiency of vehicles, so we see this as a major benefit to using CAVs in Minnesota.

What are your concerns of CAV?

- CAVs are another nail in the coffin of personal freedom.
- CAVs need to be implemented with the proper funding so that they will be successful.
- Cost are at the top of my list. Where will this come from?
- Cost is huge, plus many things can still go wrong: AI, GPS, power, maintenance
- Hackers crashing the CAVs, lost jobs, taxes, government being involved.
- How are you going to have traffic mixed with drivers and CAV cars and trucks?
- I think my primary concern is that the humans involved are safe,
- I would also add the cybersecurity. There are wealthy companies who stand to lose a lot w CAV's,
- Integration into the current transportation system,
- People vandalizing or stealing these vehicles, unless you have built in cameras and GPS systems.
- Regulation needs to establish who is responsible before they are allowed to operate.
- SAFETY is the major concern, which I do not see as an option on this list.
- security is a major concern. If this cant be demonstrated as being safe, people will not use it.
- Security/privacy is a treat with computers. Manual override/hard system shutdown should be mandatory,

- States barely have the funds to build/maintain current roadways, let alone add CAV infrastructure.
- The cost is prohibitive.
- There will be a big loss of driving jobs.
- Transition will be interesting/challenging - from current vehicles to CAV; old/new interactions,
- We need to create the infrastructure to make sure that CAV promote equity rather than magnifying it.
- We need to ensure CAVs are accessible to everyone. They may actually put more cars on the road, not.
- We can't even keep our current roads in good shape, what happens when we HAVE to keep roads up to date
- Concerned that sprawl will increase drastically as people move further away from where they work.
- I am very concerned that detection of people biking, walking, and rolling does not even appear here.
- I truly believe the best solution to many problems is less vehicles on the road, and this won't solve
- If hackers or terrorists can hack into CAV they could cause massive destruction.
- Main concern would be policy not keeping pace with industry. Regulation around cybersecurity needed.
- Newer tech may be unaffordable for some. Infrastructure changes could be profound.
- People in Greater Minnesota will have more hesitation to use and acquire the technology.
- Public and private must work together.
- We need to ensure that people walking and biking are not negatively affected by CAV implementation.
- Will introducing CAVs into urban areas create an even bigger divide between urban and rural?
- CAVs will promote sprawl by promoting more trips and longer trips.
- Currently, our schools are not graduating enough engineers to meet the needs of companies.
- Funding for transportation is already an issue, and much of CAV technology requires infrastructure.
- If it's easier and faster, people will sprawl until their commutes again feel like the same effort.
- Land use that is more sprawling than currently is my biggest concern due to the environmental impact.
- Need to replace gas tax and registration fees with a Mileage Based User Fee.
- Parking CAVs like personal vehicles doesn't reduce road use/congestion.
- The ability of customers to get economical off-peak rates and charging capabilities.
- Who will be responsible for insuring the vehicle? Roadside units & other infrastructure is expensive.
- Worried about sprawl, increased VMT, loss of public transit funding.